

What is Claimed:

- 1 1. A semiconductor structure comprising:
 - 2 an insulator layer formed of a first polymer; and
 - 3 an organic semiconductor layer formed of a second polymer,
- 4 wherein the first and second polymers self-assemble into a well-ordered co-
- 5 polymer structure with the semiconductor layer positioned adjacent the insulator layer.
- 1 2. The semiconductor structure of claim 1, wherein the co-polymer is a
2 block co-polymer.
- 1 3. The semiconductor structure of claim 1, wherein the organic
2 semiconductor layer comprises carbon-based nanotubes.
- 1 4. The semiconductor structure of claim 1, wherein an interface between
2 the insulator layer and the organic semiconductor layer is substantially free of
3 contamination.
- 1 5. The semiconductor structure of claim 1, wherein the structure is a
2 lamella structure with the insulator and semiconductor layered in parallel.
- 1 6. The semiconductor structure of claim 1, wherein the structure is a
2 parallel cylindrical structure with parallel cylinders of the organic semiconductor
3 surrounded in a matrix of the insulator.

- 19 -

1 7. The semiconductor structure of claim 1, wherein the structure is a
2 vertically layered cylindrical structure with cylinders of the organic semiconductor
3 surrounded in a matrix of the insulator.

1 8. The semiconductor structure of claim 1, wherein the structure is a
2 lamella structure with the insulator and the semiconductor vertically layered in alternate
3 lamellae of the insulator and the semiconductor.

1 9. An organic, thin-film semiconductor device comprising:

2 an insulator layer formed of a first polymer; and

3 an organic semiconductor layer formed of a second polymer,

4 wherein the co-polymers self-assemble into a well-ordered co-polymer
5 structure with the semiconductor layer positioned adjacent the insulator layer.

1 10. The semiconductor device of claim 9, wherein the device is a
2 transistor.

1 11. The semiconductor device of claim 10, wherein the transistor is a
2 multi-gate transistor.

1 12. The semiconductor device of claim 9, wherein the device is a
2 thyristor.

1 13. A process of manufacturing a thin-film organic semiconductor device,
2 the process comprising:

3 (a) providing a substrate;

4 (b) applying to the substrate an insulator layer formed of a first polymer and
5 an organic semiconductor layer formed of a second polymer, wherein the polymers self-
6 assemble into a well-ordered co-polymer structure with the semiconductor layer positioned
7 adjacent the insulator layer; and

8 (c) removing parts of the insulator between the organic semiconductor layer,
9 thereby separating the layers of organic semiconductor.

1 14. The process of claim 13, wherein the co-polymer is a block co-
2 polymer.

1 15. The process of claim 13, wherein the organic semiconductor layer
2 comprises carbon-based nanotubes.

1 16. The process of claim 13, wherein an interface between the insulator
2 layer and the organic semiconductor layer is substantially free of contamination.

1 17. The process of claim 13, further comprising the step of forming at
2 least one gate electrode on an exposed surface of the insulator layer.

1 18. The process of claim 17, further comprising the step of forming a
2 source electrode and a drain electrode at the ends of the organic semiconductor layer.

1 19. The process of claim 13, further comprising the step of forming at
2 least two gate electrodes on an exposed surface of the insulator layer.

- 21 -

- 1 20. The process of claim 19, further comprising the step of separating the
- 2 at least two gate electrodes.